

Before the
Federal Communications Commission
Washington, D.C 20554

In the Matter of)
)
Inquiry Regarding Carrier Current Systems) ET Docket No. 03-104
Including Broadband over Power Line Systems)
)

Comments of Leonard E. Kay, Ph.D., P.E., Amateur Extra Class

Gentlemen:

In the above referenced NOI you have asked for comments on “what changes, if any, we should make to our Part 15 rules to promote and encourage the new BPL technology and to our measurement procedures for all types of carrier current systems’. In this letter I would like to provide you with my comments

Let me first voice a general concern. As a very active Amateur Radio operator and Registered Professional Engineer, I have strong concerns regarding the potential danger BPL poses for interference at HF frequencies – to the amateur bands, and to the other spectrum users as well - land, fixed, and mobile services, military and commercial.

I would remind the Commission that in no way is this issue a ‘balancing’ act (in the legal sense of the word). Especially since BPL will operate under Part 15(C) of the Rules, we should be starting from the assumption that any BPL solution should insure “that no harmful interference is caused” (§15.5(b)). This assurance can come only through extensive *field testing by independent parties – not from the telecom and power utility industries*. They have a vested interest.

NTIA Chairman Victory agrees, in her April 24 letter to Chairman Powell: “I also urge the Commission to promptly adopt any subsequent rule changes that may be appropriate to facilitate broadband PLC deployment, *while ensuring that those rules prevent harmful radio frequency (RF) interference to other communications mediums*.” [my italics].

Due to these concerns, it is my opinion that Part 15 must be strengthened to insure that deployed BPL systems can coexist with the legitimate Primary Allocated services which occupy the HF spectrum (1.8 – 30 MHz) without causing harmful interference. BPL is a technology like no other to date, in terms of its potential for being an “unintentional radiator”. As the Commission itself concurs in the NOI (pages 2 and 3):

- “Second, at frequencies below 30 MHz, where wavelengths exceed 10 meters, long stretches of electrical wiring can act as an antenna, permitting the RF energy to be radiated over the airwaves.”
- “carrier current devices have operated generally on frequencies below 2 MHz with limited communications capabilities over the electric power wiring....New BPL devices operate(e.g., from 4.5 MHz to 21 MHz)”
- “This new generation of high-speed BPL devices that use wide spectrum was not contemplated under the existing Part 15 rules when they were formulated”.

Once Part 15 is thus amended, we must then make sure that commercial interests comply with a rewritten Part 15 *up front* – through Verification testing – not enforced after the fact through litigation.

Having described my concerns, I would now like to offer the following suggestions.

1) Concerning Testing and Verification.

Being carrier-current devices and thus classified as “Verified” under §15(C), BPL devices must be tested for compliance. This requirement **must** be maintained moving forward.

In NOI Paragraph 23 you ask “How should the measurement procedures for testing existing low-speed carrier current systems be developed in order to avoid the burden of selecting representative installations and to promote consistency and repeatability of test results?”

I don’t think you can avoid the burden. Remember we are discussing HF frequencies, where wavelengths are in the 100- to 10-meter range, and each installation will have its own unique resonances and radiation characteristics. Effort should be directed into developing a set of standard qualification tests for field verification.

2) On Allowable Field Strengths and Measurement.

This is in my opinion the biggest red flag for contention. The Part 15(c) limits defined in §15.209 must be reviewed and updated. What the new limits might become, **and how we measure them**, is critical. Stations in the Amateur Service (and other HF users as well) often work with weak signals during routine communication and technical experimentation, not to mention under emergency and disaster situations.

§ 15.209 states the following radiated emission limits of intentional radiators at HF:

Frequency (MHz)	Field Strength (microvolts/meter)	Measured Distance (meters)
1.705-30.0	30	30

An allowed field strength of 30 uV/m is *huge* in this context. Assuming standard values of a 50 ohm load and an isotropic receiver, this translates into a received signal of 512 uV at 1.8 MHz or 31uV at 30 MHz(!). For a modern HF transceiver, with a reference sensitivity of 0.1uV for a discernable signal above the receiver noise floor, these signals represent strengths of **S9+20 and S8 respectively** – the latter being strong enough to swamp most long-distance skywave signals, Amateur and SW Broadcast included, and the former, *everything on the band!!* Further, since BPL would be a 24/7 service, this harmful interference would also be constantly present. It is clear these limits need to be revisited, redefined, and probably restructured.

A standard set of field strength measurements also needs to be developed. Whatever they are, to satisfy the worst case they must be conducted using the highest expected BPL data rates and highest allowable ERP present at any point. This should **not** be a scenario where we catch ‘most of the problems’ and patch the leaks later.

3) Previous Studies show BPL not deployable.

Several studies made to date have already shown that typical BPL/PLC field strengths and installations will cause extremely harmful interference levels at HF – enough that the Japanese government and several EC nations have already decided not to deploy BPL. I direct you to the following links for more information:

1) “On Radio Interference Assessments of Access PLC System”, C Muto, N Mori, and T Kondoh, *7th International Symposium on Power-Line Communications and Its Applications*, March 2003, in which the authors discuss radiated emissions measurements taken in Japan, **and the subsequent decision by the Japanese authorities to not deploy BPL/PLC at this time:**

<http://www.qsl.net/jh5esm/PLC/isplc2003/isplc2003a2-3.pdf>

2) “Calculated Impact of PLC on Stations Operating in the Amateur Radio Service”, E. Hare, *Meeting of the IEEE C63 EMC standards committee*, November 2002. Among the author’s conclusions are **ambient noise level near PLC systems could increase as much as 70 dB**. Much more study is needed.

<http://www.arrl.org/tis/info/HTML/plc/files/C63NovPLC.pdf>

3) “Compatability of VDSL and PLT with Radio Services in the Range 1.6 MHz to 30 MHz”, *Final Report of the UK Technical Working Group*, Oct. 2002.

<http://www.radio.gov.uk/topics/interference/documents/twg-finalreport.pdf>

Among the authors’ conclusions are:

- “the results of measurements within a few metres of PLT Access cable showed that, at such distances, emissions detected were significantly higher than would be required to meet the protection requirements stated by radio users”
- “the stated requirements of UK HF users for a very small increase in ambient noise, associated with near field emissions, would be difficult or impossible for PLT operators to meet”.

4) Concerning Commercial and Utility interests

Manufacturers of BPL systems must be held accountable for their equipment, as must be the power companies. Tightening Part 15 is the only way to insure that there are a) fewer possible loopholes to begin with and b) legal recourse for parties suffering interference from Part 15 BPL devices.

Power distribution systems in the U.S. are already known to cause interference to HF receivers where such systems are poorly maintained. It is a known fact in the Amateur community that power companies have a poor track record of responding to legitimate interference complaints by Amateurs, and BPL has the potential to greatly magnify this problem. Any new regulations must contain special provisions which require BPL service providers to respond quickly to any HF interference complaints, and to do so by completely eliminating such interference.

5) Timetable

I would suggest that FCC authorization of BPL deployments be postponed until sufficient field trials and measurements of field emission and HF/VHF interference are completed, and technical arguments by the Amateur community, the American Radio Relay League, and the IEEE have been heard by the Commission. The BPL genie will be difficult to put back in the bottle.

Conclusion

In summary, allow me to reiterate my main points.

- Part 15, Subpart C, must insure that BPL systems continue to be Verifiable, and individually meet §15.209 maximum radiation limits.
- The §15.209 limits must be amended, after further study of interference potential, so that maximum field strengths in the vicinity of receivers in the 1.8-30 MHz range are low enough to insure that expected received noise floors (which, remember, is **not** the noise floor of the measuring equipment) - are not increased from their current levels.
- *This is not a 'balancing' act (using the legal sense of the word) between users of the HF spectrum (Amateur Radio in particular), and the commercial desire for additional home broadband access options.* The HF spectrum users represent Primary Allocated Services who must be protected from unintentional radiation under Part 15. Amateurs, in particular, are a critical resource for communication in support of our country, and the Amateur Service stands to suffer greatly if BPL is deployed under Part 15 as it stands today. The role of the Amateur Service in communication preparedness is one which is repeatedly reaffirmed, most recently by the Department of Homeland Security.
- Since, in my opinion, there is insufficient field data at the present time to allow any BPL proposal to move forward, I will be writing my Congressmen and members of the Senate Commerce Committee to ask that the FCC be directed to delay BPL deployment until any and all necessary studies have been completed.

Respectfully yours,
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